

May 18, 2023

Telecom Regulatory Authority of India
Attention: Shri Akhilesh Kumar Trivedi
Advisor (Network, Spectrum & Licensing)
advmn@traai.gov.in

Reference: Consultation Paper No. 6 / 2023 (Assignment of Spectrum for Space-based Communications Services; Comments of Globalstar, Inc.)

Dear Sir:

Enclosed, please find the comments of Globalstar, Inc. on the Consultation Paper on Assignment of Spectrum for Space-based Communications Services.

Globalstar is a leading provider of global mobile satellite services. Operating continuously in the L and S bands for more than two decades, Globalstar's LEO constellation supports the delivery of reliable service to consumers, commercial industries, and emergency and public safety personnel around the world.

Thank you for giving us the opportunity to provide comments to this consultation paper.

Sincerely,

L. Barbee Ponder IV

L. Barbee Ponder IV
General Counsel and Vice President of Regulatory Affairs

COMMENTS OF GLOBALSTAR, INC.

Globalstar, Inc. (“Globalstar”) is pleased to provide comments in support of the consultation issued by the Telecom Regulatory Authority of India (“TRAI”) regarding an “Assignment of Spectrum for Space-based Communications Services.”

Globalstar is a US publicly traded company (NYSE: GSAT) duly registered in the State of Delaware. It owns and operates a Low Earth Orbit (“LEO”) satellite system providing near global coverage, including India (“Globalstar System”). Founded in 1995, Globalstar has been providing mobile satellite services (“MSS”) to the public for more than twenty years, having invested approximately US \$5 billion in its satellite network and ground operations during this period.

The Globalstar System consists of three separate components: (1) a constellation of LEO satellites, properly notified to the International Telecommunications Union (“ITU”); (2) a global network of 28 gateway Earth Stations located in eighteen countries; and (3) mobile devices and terminals operating over Globalstar’s MSS network, including those used by over 760,000 of Globalstar’s own end-user customers in over 120 countries worldwide to meet their communications needs.

In a significant breakthrough, Apple Inc. last year announced a revolutionary, direct-to-handset “Emergency SOS via satellite” feature using Globalstar’s MSS network that is now available to users of the iPhone 14 family of devices. Apple’s Emergency SOS via satellite feature allows users to initiate emergency communications through MSS transceivers contained in the Apple iPhone 14 family of devices. This satellite-enabled feature is now available in the US, Canada, ten European countries, and most recently Australia and New Zealand, with more nations to be added in the coming months. The iPhone 14’s Emergency SOS via satellite feature is being used daily to request emergency assistance in the markets where the feature has been introduced.

As Globalstar grows its mobile satellite business, it has embarked on a comprehensive global strategy to develop its direct presence and regulatory compliance in numerous countries around the world. India represents the single largest market that Globalstar has been previously unable to enter. It is Globalstar’s hope that this consultation results in the TRAI instituting regulatory and licensing reforms that permit its entry.

THE GLOBALSTAR SYSTEM

The Space Segment

The Globalstar constellation consists of non-geostationary orbit (“NGSO”) satellites that operate in eight orbital planes equally spaced around the Equator at an inclination of 52° and an altitude of 1414 kilometers. This configuration of the constellation provides almost complete coverage of the planet, including India.



Figure 1. Globalstar's satellite constellation

Originally licensed in the US by the FCC for a first-generation constellation (“HIBLEO-4”) in 1995, Globalstar’s second-generation constellation (“HIBLEO-X”) was deployed by Globalstar and notified to the ITU by the French Administration in 2010. Globalstar has also contracted for the procurement of 17 new satellites that will replenish its US-licensed HIBLEO-4 constellation. Using a transparent transponder architecture, Globalstar satellites apply proven technology to provide global coverage communications, providing fast switching and ensuring low latencies for data communications.

Globalstar satellites operate in MSS spectrum allocated in the L and S bands. This spectrum is a global allocation enabling small hand-held devices with omni-directional antennas to connect directly with the satellites. Each satellite is equipped with multiple receivers and transceivers, making use of the spectrum assignments registered with the ITU by Globalstar in the L and S bands, as well as in the C band for communications with Gateway Earth Stations.

The transmitters and receivers are divided into 16 individual beams that are dynamically switched to ensure the management of interference and spectral efficiency.

The Ground Segment

The Globalstar System utilizes a unique “bent-pipe” architecture whereby the satellites “hear” and transmit data traffic between Globalstar’s mobile terminals and a global network of gateway Earth Stations.

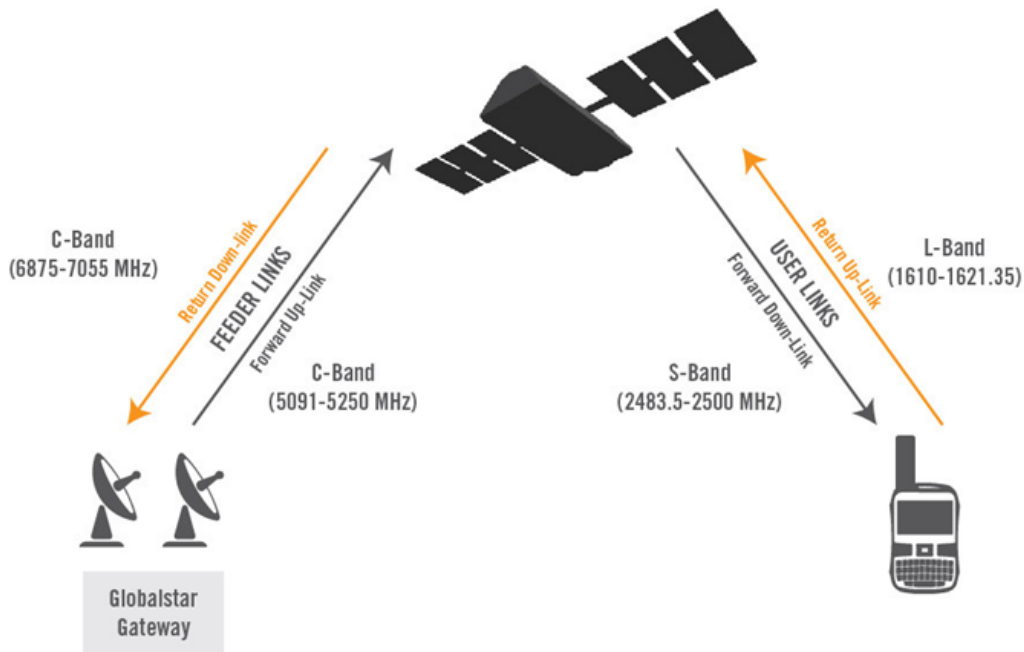


Figure 2. Description of the forward and return links and spectrum used by Globalstar

Globalstar has in recent years made a substantial investment in the enhancement and expansion of its global ground infrastructure. Globalstar has upgraded all of its existing gateway Earth Stations through the deployment of second-generation feeder link antennas, and has extended its MSS service footprint with the addition of ten new gateway Earth Station locations around the world. Overall, Globalstar’s MSS network currently utilizes 28 gateway Earth Stations worldwide in eighteen countries, with each providing between 700,000 and 1 million square miles of coverage over the surface of the Earth. Globalstar expects to continue its ground infrastructure expansion well into the future.



Figure 3. Globalstar Gateway Ground Stations



Figure 4 Kilingi- Nõmme, Estonia Gateway

Globalstar Devices and Services

Globalstar has focused its products and services on individual consumer and commercial industrial applications. Unlike most satellite segment operators, which focus on wholesale capacity agreements with terrestrial segment resellers (such as VSAT operators), Globalstar achieves affordable prices and rapid service integration by avoiding complex supply chains.

As indicated above, during 2022 there was a significant breakthrough relating to the use of Globalstar's MSS network for consumer-oriented applications. In November 2022, Apple's transformative, direct-to-handset "Emergency SOS via satellite" feature became available to users of the iPhone 14 family of devices for the first time over Globalstar's MSS network in the United States and Canada. The availability of Apple's satellite-enabled feature has since been extended to ten European countries, as well as, most recently, Australia and New Zealand. More nations will be added in the coming months. The Emergency SOS via satellite feature enabled via Globalstar's licensed MSS frequencies allows users to initiate emergency communications through MSS transceivers contained in the Apple iPhone 14 devices. This feature is now being used daily and has already resulted in multiple lifesaving rescues since its launch. With Apple iPhone 14 devices having the potential through the Emergency SOS via satellite feature to use Globalstar's network for emergency communications in numerous countries around the world, Globalstar's L- and S-band spectrum will be the most widely available and intensively utilized MSS frequency bands in existence.

Globalstar's MSS services are also delivered to consumers through dedicated MSS user terminals designed primarily by Globalstar, offering a wide range of applications. Globalstar's affordable and innovative "SPOT" family of MSS devices has since 2007 played a critical role in providing emergency and safety-of-life services to individual consumers beyond terrestrial wireless reach. Globalstar's SPOT products work virtually everywhere in the world, offering communication through satellite connectivity to hundreds of thousands of people who travel off the grid. SPOT users can track assets using SPOT Trace for anti-theft and can use SPOT Gen4 and SPOT X for tracking, location-based messaging, and S.O.S. signaling to get help. The entry-level device, the SPOT Gen4, is priced at US \$150.00 with an annual subscription cost of US \$163.35. Relative to Satellite Phone offers or even compared to VSAT capacity costs, these prices are significantly more affordable.

Globalstar's SPOT X provides two-way satellite communications to stay connected to remote and lone workers who can check-in and provide detailed status of their situation when working at remote jobsites. SPOT X provides users with a unique, personal mobile number that allows either party to initiate conversations at any time. With the ability to communicate the nature of emergencies with emergency services, the SPOT X has led to more efficient rescues.

In total, more than 9,500 SPOT rescues have taken place in over 80 countries on six continents around the world, including over 90 rescues in Asia.

Globalstar’s MSS network can also provide critical back-up capabilities for public safety personnel during disasters, when terrestrial networks can be rendered inoperable. In situations where all terrestrial wireless facilities are down in an affected area, Globalstar’s global MSS network will continue to function normally. Public safety entities involved in relief efforts around the world have relied on Globalstar’s satellite services after earthquakes, hurricanes, and other disasters.

In addition, Globalstar has developed an array of products for Internet of Things (“IoT”) applications in a wide range of industries, including oil and gas, mining, construction, transportation, agriculture, emergency management, government, maritime, and commercial fishing. Globalstar’s satellite IoT products allow enterprises to streamline their operations and intelligently manage, monitor, and track their mobile assets remotely via Globalstar’s MSS network. Globalstar’s commercial IoT products include its SmartOne asset tracking solutions and IoT satellite transmitters, which enable its customers to manage their remote assets utilizing motion sensors, comparative GPS positions, and custom-configured sensors.

For example, the SmartOne Solar device provides a low maintenance and cost-efficient tracking option powered by solar-rechargeable batteries that can deliver up to ten years of life. The extended functionality can be used for wildlife monitoring and preservation, tracking for leisure boat owners, and asset monitoring including shipping containers, transport trailers, construction/farm machinery, and vehicle fleets. The SmartOne C transmits basic performance indicators of remote assets or assets in motion in real time, enabling commercial applications in shipping, supply chain management, oil and gas, and more.



Figure 5. Globalstar Product Line

Overall, Globalstar has distinguished itself for more than twenty years as the only operator in the consumer-centric satellite segment, providing essential services to hundreds of thousands of individuals and businesses.

Further, looking to the future, Globalstar is well-positioned to take advantage of the 3GPP Release 18 specification, whereby its L and S-band frequencies are being considered for adoption. When adopted, Globalstar will be uniquely positioned to augment cellular communication with our satellite coverage for emergency, IoT and other low-data use cases.

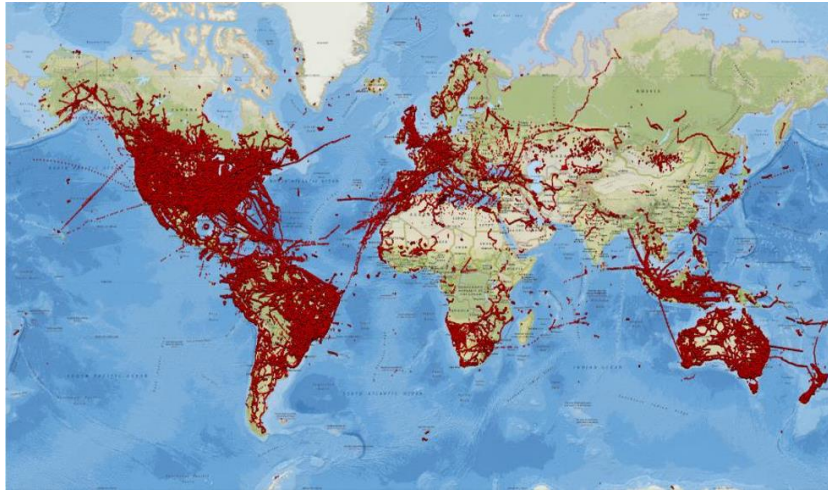


Figure 6. Map of traffic flowed via Globalstar

GLOBALSTAR'S RESPONSES TO THE SPECIFIC QUESTIONS

In its comments on the Consultation Paper on Assignment of Spectrum for Space-based Communications Services, Globalstar focuses its responses on five questions provided by TRAI.

Q3. Whether there is any practical limit on the number of Non-Geo Stationary Orbit (NGSO) satellite systems in Low Earth Orbit (LEO) and Medium Earth Orbit (MEO), which can work in a coordinated manner on an equitable basis using the same frequency range? Kindly justify your response.

Globalstar's LEO satellites operate in MSS spectrum allocated in the L and S bands. With respect to the MSS L and S bands, the Consultation states in Subsection 3.28 that “[b]eam width of the user terminals in the lower frequency bands (viz. L-band and S-band) is much wider than that for the user terminals in the higher frequency bands (such as C-band, Ku-band, and Ka-band),” and “[t]herefore...currently frequency reuse in L-band and S-band is not possible within the same geographical area for MSS. Hence, the frequency spectrum in these bands is assigned to service providers on exclusive basis for providing MSS.” (The Consultation includes similar statements in Subsections 2.25 and 3.29.)

Globalstar agrees with TRAI that frequency reuse and spectrum sharing within the same geographical area is not currently possible in a frequency band used for MSS. As the FCC in the US recently noted, the “use of omnidirectional antennas” in MSS spectrum “prevents others from using the same frequencies due to interference.” *Communications Marketplace Report, 2022 Communications Marketplace Report, FCC 22-103 at ¶ 178 n.560 (rel. Dec. 30, 2022)*. Accordingly, except for a 0.95 megahertz band segment (1617.775-1618.725 MHz) in which both Globalstar and US MSS licensee Iridium are authorized, Globalstar is the only MSS operator licensed in the US in its portion of the L and S bands (1610-1618.725 MHz/2483.5-2500 MHz).

Nations around the world have generally adopted this licensing approach in the MSS L and S bands.

As indicated above, with Apple iPhone 14 devices having the potential through the Emergency SOS via satellite feature to use Globalstar’s network for emergency communications in numerous countries around the world, Globalstar’s L- and S-band spectrum will be the most widely available and intensively utilized MSS frequency bands in existence. A national administration’s authorization of an additional MSS operator to provide service in this spectrum would result in extensive, harmful interference to Globalstar’s MSS operations in the relevant geographic area, including to its emergency communications and safety-of-life services.

Q15. What should be the methodology for assignment of spectrum for user links for space-based communication services in L-band and S-band, such as-

- (a) Auction-based**
- (b) Administrative**
- (c) Any other?**

Please provide your response with detailed justification.

As TRAI notes in Subsection 3.29, “in India, spectrum in L-band is being used by a public sector undertaking (PSU) under ‘sui-generis’ category license for MSS,” while currently “there is no assignment of frequency spectrum for commercial communication services in S-band.”

Going forward, the assignment of spectrum licenses in India for MSS user links in the L and S band should not be auction-based. Auctions are not the appropriate license assignment mechanism for MSS and other satellite spectrum. Satellites operate in an inherently international environment, and auction-based satellite licensing would be contrary to the licensing approach taken by virtually all countries worldwide. Significantly, the nations with the most advanced satellite sectors (including the US, the UK, Canada, and France) generally do not auction spectrum for satellite services, whether for space stations or earth stations.

Globalstar and other MSS providers in satellite-allocated spectrum operate in accordance with a fully developed international regulatory framework – one that promotes innovation and investment – as recognized by ITU Member States. If TRAI adopts auction-based licensing in the MSS L and S bands, this assignment approach would represent a significant departure from the established international framework. This spectrum policy shift would result in complexity and could disrupt the international MSS marketplace.

The use of auctions as a licensing mechanism for satellite services could also lead to spectrum licenses being held exclusively by the entities with the greatest financial resources, rather than by those satellite operators best positioned to provide beneficial services and serve the public interest. In addition, if auctions were adopted not only in India but in numerous other countries as well, the aggregate financial burden placed on international satellite operators by widespread auctions could curtail these operators' innovation, investment, and service quality, and could even raise questions about the sustainability of the satellite sector's business models.

Rather than conduct auctions, TRAI should implement fair and transparent administrative procedures for assigning spectrum for user links in the MSS L and S bands. Numerous countries globally take this approach in the satellite context, and TRAI should follow established norms in the assignment of satellite spectrum. Through such administrative processes, TRAI can determine which satellite operator will provide L- and S-band MSS in India in a manner that will best promote the public interest.

The administrative framework for such licensing of spectrum for user links in the L and S bands should provide a clear and efficient path for obtaining such licenses, including application requirements, timeframe for issuance, and any regulatory fees associated with the consideration of the application and issuance of the requested license. The license should include a defined term for operations of at least ten years.

As mentioned above, India constitutes the largest market that Globalstar has so far been unable to enter. Globalstar hopes that TRAI adopts the above-described administrative licensing framework for the L and S bands and undertakes an assignment process that finally permits Globalstar's entry and its provision of MSS within India. As a long-established yet growing global MSS operator in the L and S bands, Globalstar is the entity that is best positioned to provide such service in India. Globalstar is a highly experienced MSS operator that has been providing service to the public globally for more than twenty years. Globalstar's MSS offerings would provide substantial benefits to consumers, commercial industries, and emergency and public safety personnel throughout India. Apple's revolutionary, direct-to-handset "Emergency SOS via satellite" feature using Globalstar's MSS network is now available to users of the iPhone 14 family of devices, enabling users to initiate emergency communications through MSS transceivers contained in these devices. Globalstar's affordable and innovative "SPOT" family of MSS devices can also play a crucial role in providing emergency and safety-of-life services to individual consumers, and its array of satellite IoT applications would serve the needs of a variety of commercial industries in India.

Significantly, Globalstar's US-notified HIBLEO-4 system holds ITU date priority for international coordination in its licensed portion of the L and S bands. In the S band, the US-filed HIBLEO-4 system predates all other systems by almost ten years, and it also enjoys a high priority in the L band with only the GLONASS system holding a higher priority there. Notably, Globalstar's HIBLEO-4 system is the only system globally that holds priority in these bands over the Chinese

“BeiDou” or “Compass” satellite system. The ITU status of both the HIBLEO-4 system and Globalstar’s French-notified HIBLEO-X system is well respected around the world.

TRAI and other relevant agencies should initiate a transparent and fair administrative licensing process for user links in the MSS L and S bands that fully considers all of these factors.

Q19. What should be the methodology for assignment of spectrum for gateway links for space-based communication services, such as

- (a) Auction-based
- (b) Administrative
- (c) Any other?

Please provide your response in respect of different types of services. Please support your response with detailed justification.

...

Q35. In your view, which spectrum assignment option for gateway links should be implemented? Kindly justify your response.

For all of the reasons identified above in Globalstar’s response to Q15, TRAI should not assign spectrum for gateway links for space-based based communications service through auction-based procedures. Rather, TRAI should follow established norms and establish a transparent administrative framework for assigning spectrum licenses to satellite operators to establish Earth Station Gateways in India, for the purpose of providing satellite-based resources to service licensees.

The Earth Station Gateway licenses in India should include frequency assignments, permitting an Operator to transmit and receive communications to and from its satellites using ITU-allocated frequency bands for operations. In particular, TRAI should make available ITU-allocated frequency bands designated for Fixed Satellite Services (“FSS”), including the 5091-5250 MHz and 6875-7055 MHz assignments that Globalstar has used for over twenty years globally to provide MSS. The Earth Station Gateway licenses should include a defined term for operations of at least ten years and clearly specified reporting requirements and fee payments.

In conjunction with its desired provision of MSS to end users in India through an authorization for user links in the L and S bands, Globalstar, through its established local entity, would want to hold all licenses for the operation of the Earth Station Gateway(s) in India to communicate with its LEO constellation of satellites. Globalstar would establish a wholly owned subsidiary in India in order to apply for and receive the necessary licensing, as well as construct and operate the Gateway(s).

In order for Globalstar to make the necessary investment in one or more Earth Station Gateways in India, however, it must have the assurance that service licenses will be issued by India pursuant to an efficient and transparent regulatory process.

Q38. In case it is decided for assignment of spectrum on administrative basis, what should be the spectrum charging mechanism for assignment of spectrum for space-based communications services

i. For User Link

ii. For Gateway Link

Please support your answer with detailed justification.

In order to ensure that end user pricing for MSS remains as affordable as possible, TRAI should apply spectrum charges to MSS user links and gateway links only to the extent necessary to recover the cost of the regulatory process for licensing and ongoing monitoring efforts during the license term for these links.